AlphaLab Inc.

Voltage Touch Monitor Model VTM Instructions

Place the monitor on a bench top or desk. It can also be placed on an incline so that the digital display is higher than the sensor square (brass). Plug in the AC adaptor and the grounding cable. One end of this cable can plug into the ground of a wall socket (North and South America), or attach the included alligator clip or banana plug and connect this to an earth ground. Connect the other end to the monitor.

When a finger of a test subject approaches or touches the square, you will hear a click (a relay) and green light will appear, indicating DC measurement. If the finger is brought in at an unusual angle and simply placed on one corner of the square, the green light might not go on; in this case, the square is held at ground potential and DC voltage on the test subject will be discharged. Therefore, make sure that the finger is brought down onto the *center* of the square so that the relay switches *before* the finger contacts the square. (The finger can be brought down quickly because the relay is fast.) Note the voltage, which is expressed in DC volts. A negative sign will display if voltage is negative. If a grounding device is being worn, any voltage above +/- 1 indicates that the grounding device is not working well. The voltage level at which problems will occur depends on your application, and may be a few volts or up to a few hundred volts.

If the button adjacent to the square is pressed and the finger is simultaneously touched against the square (one finger does both), the green light will become red and the display will show the AC voltage on the test subject. This is the average absolute value of the 50 Hz or 60 Hz signal, and it is by definition never a negative number. If the subject is connected to ground through a typical ground resistor, the AC signal is usually between 1 to 10 volts, while DC is usually less than 1 volt. For an ungrounded person, it is reversed; the DC is typically +/- 100 to 2000 volts while the AC is 10 to 100 volts. (If the subject is connected to ground through *near-zero* resistance, both DC and AC will be zero. However, a zero-resistance grounding is *not* advised in static-sensitive applications because it can cause high-current sparks, with associated EMP, direct circuit damage, ignition and electrocution hazards.) The "average absolute value" that the monitor displays on AC can be converted to peak voltage by multiplying by 1.57. Example: a 60 Hz signal with a displayed value of 10.0 volts means that the voltage on the test subject is alternating between a positive peak of +15.7 volts and a negative peak of - 15.7 volts. To calculate the RMS (root mean square) voltage, multiply the displayed voltage by 1.11x.

Interpretation of readings and actions to be taken:

AC-- An AC measurement depends only on the *immediate* conditions and not on what the subject had been doing even one second before. AC is not cumulative, whereas DC *is* cumulative. For example, if someone who is not grounded is standing near an unshielded fluorescent lamp, significant AC voltage will be present on that person, but the AC will be gone the instant the lamp is turned off. In contrast, if an ungrounded person picks up a DC voltage, that voltage (or charge) will remain with the person until subsequently grounded. (The person could also accumulate additional DC voltage until grounding is done). Therefore, AC measurements must be done at the workstation, in proximity to any equipment normally used. Common AC sources include LCD screens, fluorescent lamps, improperly case-grounded equipment, and air ionizers (which typically produce +/-30 volt AC peaks on a subject 3 feet away with a 10 M ohm to ground wrist strap). Because of capacitive coupling, AC sources often deliver more current to the person than DC sources do. The personal grounding connector has a certain preferred value of resistance, but this value may be high enough that the AC current produces tens to hundreds of volts on the person. There are several ways to reduce AC voltage, such as moving the offending equipment farther away, shielding the equipment with a grounded metal mesh screen, or reducing the grounding resistor.

DC-- When measuring DC, the displayed value will continue to update as the subject's finger is held on the square. It is possible to carry the monitor (as long as the monitor power and ground remain connected) and watch how the voltage is affected by routine activities as long as the finger is kept in contact with the square. This procedure can identify whether the personal grounding ever goes intermittent, or if there are strong DC (or AC) sources that create a significant voltage when the ground is working properly. If unacceptably high voltages are found, the ground resistor can be reduced and/or the activity that created the voltage should be avoided. When using the monitor *without* personal grounding, voltage buildup is cumulative. (Of course there are two polarities, so an activity that charges the subject negative will *reduce* the total voltage when the subject carries a positive voltage.) Each activity that significantly changes the DC voltage should be avoided. When doing this procedure without a personal ground, the finger should be kept on the square continuously. If the finger is removed and then touched again to the square, about 10% of the cumulative voltage at that instant will be lost. (The sensor capacitance is 10 pF, whereas a person is about 100 pF.) Thus it is a good idea to avoid repeatedly touching the square and then removing the finger, because the reading will decrease each time. For example, if the subject was at -1000 volts and then rubbed the free hand across plastic that added +100 volts, the next reading would be -1000 + 100 = -900 volts. This change (from -1000 to -900) indicates that rubbing the plastic contributed +100 volts. If the subject had instead initially measured -1000 volts, *then* removed the finger and put it back (before rubbing the plastic) , it would read about -900 volts (10% less than - 1000 volts). If the plastic is subsequently rubbed, the reading will still change by 100 volts (to -800). Obviously, removing and replacing the finger increased the chance of misinterpretation.

Verification can also be done in house. To do this for DC, connect one terminal of a calibrated DC supply to the ground of the monitor (for personal safety, use 50 volts or less). Use a finger or reflective object near the square to make the green light come on, and touch the other DC supply terminal to the square. The displayed voltage should be within 2% of the applied voltage +/- 0.1 volt. A similar operation is done for AC, except that the AC button is pressed and held (red light) while a 50 or 60 Hz AC supply voltage is connected (under 50 VAC is recommended). The display reads AC in units of Average absolute value in volts. If using a multimeter to verify AC voltage, most such meters read in RMS or pseudo-RMS. Take the reading on the multimeter and divide by 1.11 to get the expected monitor reading. If using an oscilloscope to verify the AC supply voltage, measure the peak-to-peak voltage and divide by 3.14 to get the expected monitor voltage.

The warranty period for this meter is one year from the date of delivery.

Manufactured in the USA by AlphaLab, Inc. 3005 South 300 West Salt Lake City, Utah 84115 USA www.trifield.com - mail@trifield.com - (801)487-9492